

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Judith A. Varner *et al.*

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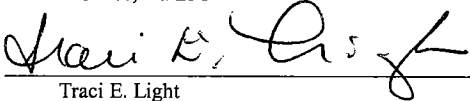
Filing Date: 09/09/2005

Examiner: Nguyen, Q.

Entitled: **Methods for Inhibiting Angiogenesis, Cell Migration,
Cell Adhesion, and Cell Survival**

**DECLARATION UNDER 37 C.F.R. §1.132
BY DR. JUDITH VARNER**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF ELECTRONIC FILING	
I hereby certify that this correspondence (along with any referred to as being attached or enclosed) is, on the date shown below, being deposited with the U.S. Patent and Trademark Office, via EFS.	
Dated: <u>March 20, 2008</u>	By: <u></u> Traci E. Light

Examiner Nguyen:

1. I, Judith Varner, am the subject of the Curriculum Vitae submitted herewith, and author of the publications shown on the list attached thereto (Tab 1).

2. I am co-author of Kim *et al.*, J. Biol. Chem. 275:33920-33928 (2002) that was cited by the Examiner in the Office Action mailed on 11/21/2007. The experiments in this reference were conducted by me or under my supervision.

3. CLAIMS 25-32

Kim *et al.* (2000) discloses that forskolin and dibuteryl cAMP inhibit angiogenesis and cell migration. Kim *et al.* states that “. . . agents that activate intracellular PKA, such as forskolin, dibuteryl cAMP or $\alpha_5\beta_1$ antagonists, suppress endothelial cell migration on vitronectin *in vitro* or angiogenesis *in vivo*. In contrast, inhibitors of PKA reverse the anti-migratory or anti-angiogenic effects mediated by $\alpha_5\beta_1$ antagonists. Therefore, $\alpha_v\beta_3$ -mediated endothelial cell migration and angiogenesis can be regulated by PKA activity, which depends on the ligation state of integrin $\alpha_5\beta_1$.”¹ Kim *et al.* (2000) also discloses that these studies “. . . are the first studies demonstrating a significant role for protein kinase A in the suppression of angiogenesis.”² Importantly, however, while Kim *et al.* (2000) used forskolin and dibuteryl cAMP to inhibit angiogenesis and cell migration, at the time of filing the above-referenced application, both forskolin and cAMP were known to act via more than one pathway. For example, de Rooij *et al.*, Nature 396:474-477 (1998) (Tab 2) disclosed that

Rap1, which “may be involved in cellular processes such as cell proliferation, cell differentiation, T-cell anergy and platelet activation,” is activated by forskolin and cAMP, and “that activation of Rap1 by forskolin and cAMP **occurs independently of protein kinase A.**”³ De Rooij *et al.* further demonstrated that instead of activating protein kinase A, cAMP binds to Epac (exchange protein directly activated by cAMP), which in turn “induces the GEF activity of Epac towards Rap1.”⁴ De Rooij *et al.* also said “that **not all cAMP-induced effects are mediated by either PKA or cyclic-nucleotide-gated channels**, the only previously known cAMP-target proteins. Several reports have suggested the existence of such pathways . . .”⁵

Therefore, it was **not clear** whether the anti-angiogenic effects of forskolin and cAMP were the result of activation of Epac or protein kinase A, or other pathways that were referred to by De Rooij *et al.* The disclosure in Kim *et al.* (2000) that was co-authored by me also **did not resolve this uncertainty**. Indeed, this unpredictability was not resolved until after I obtained the data

¹ Kim *et al.* (2000), Abstract.

² Kim *et al.* (2000), page 33927, 2nd column.

³ de Rooij *et al.*, Abstract.

⁴ de Rooij *et al.*, Abstract.

⁵ de Rooij *et al.*, page 476, 2nd column, 3rd paragraph.

(such as expression of PKA *in vivo*) that was first disclosed in the instant application. Therefore, one reading Kim *et al.* (2000) would not find it obvious that forskolin's and cAMP's effect on angiogenesis was necessarily mediated by protein kinase A. Instead, one would conclude that forskolin's and cAMP's effect on angiogenesis could have been mediated by any number of pathways, including via Epac and **independently of protein kinase A**.

Kim *et al.*, Biochem. Biophys. Res. Comm. 232:469-473 (1997) discloses that "... type II protein kinase A is the main effector in the cAMP-mediated growth regulation of SK-N-SH human neuroblastoma cells."⁶ It is important to note that Kim *et al.* (1997) discloses the role of protein kinase A on cell growth of neuroblastoma cells, not on angiogenesis by endothelial cells. Kim *et al.* (1997) relates to a **different cell type** (neuroblastoma cells versus endothelial cells) and **different phenomenon** (growth versus angiogenesis).

Mixson, U.S. Patent No. 6,080,728 (1997) discloses a "method for inhibiting tumor growth in a subject bearing a tumor, which comprises injection of DNA encoding at least one anti-angiogenic protein or peptide provided with a carrier selected from the group consisting of liposomes, micelles and cationic polymer carriers, whereby said DNA is expressed and tumor growth is inhibited."⁷ Though Mixson expresses "anti-angiogenic" proteins, it nonetheless does not disclose that this results in reducing angiogenesis, as stated in the instant Claims 15-32. Instead, all the experiments done by Mixson reported the effect of expressing proteins on "tumor size." Mixson relates to a **different phenomenon** (tumor growth) from the recited phenomenon (angiogenesis).

Srivastava *et al.*, Mol. Cell. Biol. 18:3509-3517(1998) discloses that "... activation of cyclic AMP (cAMP)-dependent protein kinase (protein kinase A [PKA]) induced Bcl2 hyperphosphorylation and apoptosis, which were blocked by the PKA inhibitor Rp diastereomers of cAMP (Rp-cAMP). This finding suggests that activation of PKA due to microtubule damage is an important event in Bcl2 hyperphosphorylation and induction of apoptosis."⁸ Thus, Srivastava *et al.* refers to **apoptosis**, which is a different phenomenon from the recited **angiogenesis** of Claims 25-32.

⁶ Kim *et al.* (1997), Abstract

⁷ Mixson, Claim 1.

⁸ Srivastava *et al.*, Abstract, and page 3510, 1st column, 1st paragraph.

4. CLAIMS 33-40

Kim *et al.* (2000) used forskolin and dibuteryl cAMP to inhibit angiogenesis and cell migration. However, Kim *et al.* is silent on apoptosis. Kim *et al.*'s angiogenesis and cell migration are **different phenomena** from the recited "apoptosis."

Kim *et al.* (1997) discloses that protein kinase A plays a role in cell growth, not in apoptosis. Kim *et al.*'s (1997) disclosure relates to a **different phenomenon** (growth versus apoptosis).

Mixson reported the effect of expressing different proteins on "tumor size," not on apoptosis. Tumor growth is a **different phenomenon** from the recited apoptosis.

Srivastava *et al.* discloses that "... activation of cyclic AMP (cAMP)-dependent protein kinase (protein kinase A [PKA]) induced Bcl2 hyperphosphorylation and apoptosis, which were blocked by the PKA inhibitor Rp diastereomers of cAMP (Rp-cAMP)." However, as discussed above, de Rooij *et al.* (Tab 2) taught that cAMP acts "**independently of protein kinase A**"⁹ through pathways such as Epac. Therefore, it is **not clear** whether the apoptotic effects that were reported in Srivastava *et al.* were the result of activation of protein kinase A, Epac, or other pathways that were known to exist.¹⁰ In addition, although Srivastava *et al.* (2000) says that induction of apoptosis was "blocked by the PKA inhibitor Rp diastereomers of cAMP (Rp-cAMP)," this still does not establish PKA's role in apoptosis because it was unknown in the art whether the diastereomers were inhibiting cAMP's action via Epac or other pathways that were known to exist, rather than via protein kinase A.

Dated: 3/12/08

By: Judith A. Varner
Dr. Judith Varner

⁹ de Rooij *et al.*, Abstract.

¹⁰ de Rooij *et al.*, page 476, 2nd column, 3rd paragraph.

CURRICULUM VITAE

NAME: Judith A. Varner, Ph.D.

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University of California, San Diego
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La Jolla, CA 92093-0819

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FAX: (858) 822-1325
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EDUCATION:

1988 **Ph.D., *magna cum laude*** /Biochemistry
University of Basel, Basel, Switzerland

1981 **Fulbright International Exchange Fellowship**
University of Basel, Basel, Switzerland

1980 **AB, with distinction (Honors), *magna cum laude***
Chemistry, with specialization in biological chemistry,
Duke University, Durham, NC

POSITIONS HELD:

2007-present **Professor In Residence**, Pending, Department of Medicine
University of California, San Diego, CA

2003-2007 **Associate Adjunct Professor**, Department of Medicine,
University of California, San Diego, CA

1999-2003 **Assistant Adjunct Professor**, Department of Medicine,
University of California, San Diego, CA

1995-1997 **Assistant Project Biochemist** , Department of
Medicine, University of California, San Diego, CA

1993-1995 **Program Manager and Scientific Investigator**,
Ixsys, Inc., San Diego, CA

1991-1993 **Postdoctoral Research Fellow**
Glaxo/University of North Carolina
Department of Pharmacology,
University of North Carolina-Chapel Hill
Chapel Hill, NC

1988-1991	Postdoctoral Fellow Department of Molecular Genetics Tampa Bay Research Institute/All Children's Hospital of University of South Florida St. Petersburg, FL
1986-1988	Visiting Scientist Basel Institute for Immunology Basel, Switzerland
1981-1986	Graduate Research Assistant Department of Biochemistry, Biozentrum, University of Basel, Basel, Switzerland
1980-1981	Fulbright Fellow Biozentrum, Basel, Switzerland
1980	Undergraduate Teaching Assistant Department of Chemistry Duke University, Durham, NC

AWARDS AND HONORS:

2008	Plenary Speaker, 11 th Annual Meeting of the Translational Research Cancer Center Consortium (TRC ³), West Virginia University, Morgantown, WV
2007	Invited panelist, Trans-NIH Working Group on Lymphatics
2007	Nominated as chair for Gordon Research Conferences: Fibronectins and Related Molecules, Angiogenesis and Microcirculation
2006-present	Chair, Tumor Microenvironment Study Section, National Institutes of Health
2006	Chair, NIH Tumor Microenvironment Workshop
2004	Invited panelist, Head and Neck Cancer Workshop, Tumor Biology Division, National Institute of Cancer, NIH
2004	Invited plenary lecturer: American Gastrointestinal Association

2003	Nominated as chair for Gordon Research Conferences: Angiogenesis and Microcirculation
2002	UCSD Transmed Grant Finalist
2002	Invited Speaker at UCSD Cancer Center Board of Director's Annual Meeting
2002	Featured UCSD Inventor at Chancellor Associates & UCSD Innovators Reception
1991-1993	Glaxo/UNC Research Fellow
1980-1981	Fulbright Fellow
1980	Woods Hole Oceanographic Institute Summer Research Fellowship
1980	Commencement Speaker, Duke University
1979	Bermuda Biological Station Wayland and Moore Research Fellowships
1977	Phi Eta Sigma, National University Freshman Honor Society
1976-1980	Angier B. Duke Memorial Scholar, Duke University
1976-1980	National Merit Scholar
1976	Rensselaer Polytechnic Institute Medal Scholarship
1976	Valedictorian, R.J. Reynolds High School, Winston- Salem, NC
1975	Rensselaer Polytechnic Institute Medal for Excellence in Mathematics and Science
1975	North Carolina Governor's School

PROFESSIONAL ACTIVITIES

TEACHING

2006	SOM 204 (Reading Group Cell Biology and Biochemistry)
2006-present	BIOM254 (Molecular and Cellular Biology); Cell Motility and Metastasis Subsection course director
2005	Graduate Student thesis committee, Erica Perryn, Department of Anatomy, University of Kansas, Kansas City, Kansas.
2004,2005	MED260 Modern Techniques in Biomedical Research
2004, 2005	CURE/EXPORT lecture series for Minority Undergraduates
2004	UCSD Extension, BIOL-40200 Cancer Biology
2004-2005	UCSD Biomedical Sciences, Cancer Biology BIOM224
2003-present	UCSD Department of Biology, Cancer Biology, BIMM 134
2001-present	UCSD Biomedical Sciences Graduate Program Minor Proposition Committee (BIOM 296)
2001-present	Howard Hughes Undergraduate Science Program
1999-present	High School and Middle School Student Laboratory Instruction at UCSD (science fair projects)
1997-present	Undergraduate Student Laboratory Instruction at UCSD
1999-present	Undergraduate Independent Study (Honors) Program at UCSD (BIO199)
1996-present	Medical Student Independent Study Program Instruction at UCSD (MED296 and MED299)
1996-present	Individual Graduate Student Instruction at UCSD (BMS296, BMS 298)
1998-present	Postgraduate (Ph.D. and M.D.) Training at UCSD
1996-present	UCSD School of Medicine/Biomedical Sciences Graduate Program Lectures (SOM203, MED260, BIOM224)

UNIVERSITY SERVICE

2006-present	MSTP Admissions Committee
2005-2006	Cancer Center Retreat Organizing Committee (2006-Chair)
2005-2007	School of Medicine Space Advisory Committee
2005-2007	Moore's Cancer Center American Cancer Society Institutional Grant Review Committee
2004-2007	Department of Medicine Committee on Appointments and Promotions (DOMCAP)
2003-present	Cancer Center Space Advisory Committee
2003-2005	Cancer Center Animal Space Advisory Committee
2002-present	Medical Scientist Training Program Interview Committee
2002	UCSD Cancer Center Grant Review Committee
2001-2005	Executive Steering Committee, In vivo Cell and Molecular Imaging Center
2000-2004	UCSD Biomedical Sciences Graduate Program Admissions Committee
2000-2003	UCSD Radiation Safety Committee, Vice Chair
2001-present	UCSD Biomedical Sciences Graduate Program Minor Proposition Committee (BIOM 296)
2000-2002	Hematology/Oncology Resident Interview Committee
1999	UCSD Medical Scholars Admissions Committee
1998-2000	UCSD Medical School Recruitment and Admissions Committee
1998-2003	UCSD Radiation Safety Committee
1997-1999	Leader, UCSD Cancer Center Laboratory Support Shared Resource

PUBLIC SERVICE

Expert Panels

2007	Trans-NIH Lymphatic Research Working Group
2006	CHTLA/USC Board of Scientific Advisors
2004	NCI Tumor Biology Division, Head and Neck Cancer Workshop

Conference Leadership

2008	American Association for Cancer Research Grant-Writing Workshop co-leader, AACR Annual Symposium, San Diego, CA
2007	Session Chair, Keystone Symposium on Host Response to the Tumor, Keystone CO
2007	American Association for Cancer Research, Chair, Angiogenesis and Lymphangiogenesis in Tumor Metastasis Minisymposium
2006	Angiogenesis Workshop Organizer and Chair, Tumor Microenvironment Study Section, Division of Cancer Biology, NCI
2006-2007	Co-Chair, Minisymposium American Association for Cancer Research Annual Meeting
2005-2007	American Association of Cancer Research Program Committee
2004-2006	Workshop Chair, UCSD Cancer Center Annual Retreat
2003	Nominated for Future Chair, Gordon Conference on Angiogenesis and Microcirculation, Newport, Rhode Island
2002	Session co-chair, Angiogenesis mini-session, ASCB annual conference, San Francisco, CA
2002	Session Chair, Keystone Symposium: Biological Response to the Extracellular Matrix, Banff, Canada

Grant Review

2008	NIH SEP, Lymphatic Biology in Health and Disease
2006-present	NIH Tumor Microenvironment (TME) Study Section, Chair

2006	NIH RAID program
2005-2007	Moore's UCSD Cancer Center American Cancer Society Institutional Grant Review Committee
2004, 2005	Medical Research Council (UK) grant review
2004	Research Grants Council (Hong Kong) grant review
2004-present	NSF Fast Lane Grant review
2003-present	NIH Tumor Microenvironment (TME) Study Section, (chartered standing member as of 7/04)
2003	NHLB P01 Review Committee
2003	NIH/NCI F09 Study Section
2003	NIH/ NCI SSSY-1 Study Section
2003	Veterans Administration Grant Review
2002	External reviewer for NIH COBRE (Center for Biomedical Research Excellence), University of Kansas
2002	UCSD Cancer Center Pilot Project grant review
2002	NIH/NHLBI K08 and K02 Study Section
2000	NIH/NHLBI P01 Study Section
2000	NIH/NIDCR P01 Study Section
1997-2000	NIH Pathobiochemistry, Biochemistry and Physiological Chemistry Special Emphasis Study Section (NRSA Review)

Editorial Boards

1997-1999	Associate editor, <i>Arteriosclerosis, Thrombosis and Vascular Biology</i>
1997-present	Member, Editorial Board, <i>Angiogenesis</i>

Manuscript Review

2006	<i>J. Investigative Dermatology</i>
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2006	<i>Nature Chemical Biology</i>
2004-present	<i>Science</i>
2002-present	<i>Nature</i>
2002-present	<i>EMBO Journal</i>
2001-present	<i>Nature Medicine</i>
2002-present	<i>Proceedings of the National Academy of Science UCSA</i>
2000-present	<i>Molecular Pharmacology</i>
2000-present	<i>American Journal of Physiology</i>
1999-present	<i>Journal of Clinical Investigation</i>
1999-present	<i>Journal of Cell Biology</i>
1998-present	<i>Journal of Biological Chemistry</i>
1998-present	<i>Cancer Research</i>
1997-present	<i>Angiogenesis</i>
1997-present	<i>Blood</i>

Scientific Advisory Boards

2004-present	LPath, Inc, San Diego, CA
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Consultantships

2006	Enterprise Partners
2004-2005	QLT, Inc.
2004-present	Biogen-Idec, Inc.
2003	Pfizer, Inc.
2001-present	Valentis, Inc.

1999-2003	EOS Pharmaceuticals
1995-2004	Boehringer-Ingelheim, Vienna, Austria
1999-2001	Axys Pharmaceuticals, Inc.
1998-1999	Metabasis, San Diego, CA
1998-1999	Progenitor, Inc., Menlo Park, CA
1998	Genetic Therapy, Inc., Gaithersburg, MD
1998-1999	Agouron, Inc., San Diego, CA
1997-1999	Allergan, Irvine, CA
1995-1999	Schering-Plough Research Institute; Kenilworth, NJ
1996	Smith Kline Beecham; King of Prussia, PA
1995-1996	Nexstar, Inc.; Boulder, CO
1995	Berlex, Inc., Richmond, CA
1995	Merck, Sharpe and Dhome; West Point, PA

Membership in Professional Organizations And Societies

2006-present	American Association for Cancer Research Program Committee
2004-present	Lpath, Inc. Scientific Advisory Board
2003-present	American Society for Biochemistry and Molecular Biology
2003-present	American Association for Cancer Research
2001-present	American Heart Association Council
1992-present	American Society for Cell Biology
1998-present	UCSD Biomedical Sciences Graduate Program
1997-present	UCSD Cancer Center

1989-present American Association for the Advancement of Science

1996-2004 American Association of University Women

Science Education Outreach Programs

2004-present Cure/EXPORT Minority Science Training Program

2005-present COPC National City Middle School Science Fair Mentor

2004-present Chair, Science Nights- elementary school science outreach program, Olivenhain Pioneer Elementary School, Encinitas, CA

2005 Co-organizer, Olivenhain Pioneer Elementary School First Grade field trip to Moores UCSD Cancer Center

2004-present Classroom volunteer, Olivenhain Pioneer Elementary School, Encinitas, CA

GRANTS

CURRENT GRANTS

1 R01 CA126820-01A1 (Varner, Judith) 1/07/2008 - 11/30/2012
NIH
The Lymph Node Microenvironment in Tumor Metastasis

5 R01 CA83133-06 (Varner, Judith) 04/01/2004 - 03/31/2009
NIH
Fibronectin-binding Integrins in Angiogenesis

5 R01 CA98048-03 (Varner, Judith) 06/25/2003 - 04/30/2008
NIH
Negative Regulation of Cell Migration by PKA

1 U54 CA119335-01 (Esener, Sadik) 09/01/2005 - 08/31/2010
NIH
Center of Nanotechnology for Treatment, Understanding, and Monitoring of Cancer

RECENTLY COMPLETED GRANTS

2005-2006	(Varner, Judith) Attenuon LLC Evaluation of ATN161 Effects on Endothelial Cell Signaling
2003-2005	0355005Y (Varner, Judith) Am. Heart Assn Western Division Endothelial Progenitor Cell Trafficking in Angiogenesis
2003-2004	(Varner, Judith) Charlotte Geyer Foundation Fibronectin binding integrins in angiogenesis
2002-2003	UCSD Cancer Center (Varner) Antegren: An Inhibitor of Tumor Angiogenesis
2001–2004	1 P20 CA91696-01 (Mattrey, Robert) National Institutes of Health In Vivo Cellular and Molecular Imaging Centers
2001-2002	UCSD Cancer Center (Varner) Regulation of Tumor Cell Metastasis by Protein Kinase A and Rho A
2000-2003	EOS Biotechnology, Inc (Varner) Preclinical Development of $\alpha 5 \beta 1$ Antagonists
2000-2002	BIOSTAR (Varner) S99-46 “Preclinical Development of Integrin $\alpha 5 \beta 1$ Antagonists”
1997-2001	National Institutes of Health (Varner) 5 R01 CA71619 Integrin $\alpha 5 \beta 1$ and Tumor Cell Growth
1998-2002	National Institutes of Health/Stanford University (Quertermous) National Heart Lung and Blood Institute 5R01HL52168-06 “Molecular Basis of Endothelial Cell Differentiation”

INVITED LECTURES

March 2008	“Integrin $\alpha 4 \beta 1$ in lymphangiogenesis and tumor metastasis” Gordon Research Conference on Lymphatic Biology in Health and Disease, Ventura, CA
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February 2008	"Integrins in the tumor microenvironment," Plenary Speaker, 11th Annual Meeting of the Translational Research Cancer Center Consortium (TRC3), West Virginia University, Morgantown, WV
October 2007	"Integrin $\alpha 4\beta 1$ in angiogenesis and lymphangiogenesis" AACR-NCI-EORTC International Conference on Molecular Targets and Cancer Therapeutics, San Francisco, CA (cancelled due to San Diego area wildfires)
August 2007	"Integrin $\alpha 4\beta 1$ in angiogenesis and lymphangiogenesis" Gordon Conference on Angiogenesis and Microcirculation, Newport, Rhode Island
June 2007	"Integrin $\alpha 4\beta 1$ in angiogenesis and lymphangiogenesis" Elan Pharmaceuticals, San Francisco, CA
April 2007	"Integrin $\alpha 4\beta 1$ in lymphangiogenesis and tumor metastasis" Gordon Research Conference on Fibronectin, Integrins, and Related Molecules, Il Ciocco, Italy
February 2007	"Lymph node lymphangiogenesis promotes tumor metastasis" 9th International Symposium on Anti-Angiogenic Agents: Recent Advances and Future Directions in Basic and Clinical Cancer Research La Jolla, CA
January 2007	"Lymph node lymphangiogenesis promotes tumor metastasis" Keystone Symposium Host Response to the Cancer Cell, Keystone, CO
December 2006	"Integrins in Angiogenesis and Lymphangiogenesis", UCSD Cancer Center, La Jolla, CA
December 2006	"Integrin $\alpha 4\beta 1$ in angiogenesis and lymphangiogenesis", Biogen-Idex, La Jolla, CA
August 2006	"Integrin $\alpha 4\beta 1$ in lymphangiogenesis", Gordon Research Conference on Lymphangiogenesis, Les Diablerets, Switzerland
April 2006	"Angiogenesis", Cancer Biology (BIMM134) UCSD Biology

February 2006	"Lymph node lymphangiogenesis is required for metastasis" Tumor Microenvironment Study Section, Workshop, Keystone, CO.
January 2006	"Fibronectin-binding integrins in angiogenesis" Department of Cellular and Molecular Medicine, HHMI and Ludwig Institute Seminar Series, UCSD, La Jolla, CA
January 2006	"Fibronectin-binding integrins in angiogenesis" Lineberger Cancer Institute, University of North Carolina, Chapel Hill NC
November 2005	"Integrin $\alpha 4 \beta 1$: A novel tumor target" AACR-NCI-EORTC International Conference on Molecular Targets and Cancer Therapeutics, Philadelphia, PA
October 2005	"Fibronectin-binding integrins in angiogenesis" RDCC seminar series, University of California, San Diego, La Jolla, CA
October 2005	"Techniques in Angiogenesis Research" (MED260), UCSD Biomedical Sciences Graduate Program, La Jolla, CA
September 2005	"Fibronectin-binding Integrins as Novel Tumor Targets" Moores UCSD Cancer Center Targeted Therapies in Oncology Symposium, La Jolla, CA
August 2005	"Vascular Biology and Cancer" CURE/EXPORT/HCOF Seminar Series, University of California, San Diego, La Jolla, CA
May 2005	"Tumor Microenvironment", Cancer Biology (BIMM134) UCSD Biology
April 2005	"Integrin $\alpha 4 \beta 1$ promotes homing of stem cells to neovasculature" American Society of Anatomists (FASEB), San Diego, CA
November 2004	"Two roles for Integrin alpha 4 beta 1 during angiogenesis" Atherosclerosis and Vascular Biology Seminar Series University of California, San Diego, La Jolla, CA
October 2004	Techniques in Angiogenesis Research (MED260), UCSD Biomedical Sciences Graduate Program, La Jolla, CA
September 2004	"Integrin $\alpha 4 \beta 1$ in angiogenesis "UCSD Cardiovascular Sciences Division, UCSD, La Jolla, CA

September 2004	"Integrin $\alpha 5\beta 1$ in angiogenesis" Genentech, San Francisco, CA.
June 2004	Integrin $\alpha 4\beta 1$ in angiogenesis, Biogen-IDEC at UCSD Cancer Center, La Jolla, CA
June, 2004	Angiogenesis in Tumor Biology (BIOM 224), UCSD Biomedical Sciences graduate course in Cancer Biology, UCSD, La Jolla, CA
May 2004	"Integrins in angiogenesis," Head and Neck Cancer Workshop, Division of Cancer Biology, National Cancer Institute, National Institutes of Health, Washington DC
May 2004	"Tumor Microenvironment", Cancer Biology (BIMM134) UCSD Biology
May 2004	"Mechanisms regulating angiogenesis" Basic Research Division, UCSD Cancer Center, University of California, San Diego
May 2004	"Anti-angiogenesis in cancer therapy," plenary lecture, American Gastrointestinal Association, New Orleans, LA
April 2004	"Integrins in Angiogenesis", QLT, Vancouver, British Columbia
April 2004	"Integrin $\alpha 5\beta 1$ and PKA in angiogenesis", Attenuon, Inc., San Diego, CA
March 2004	"Angiogenesis and the tumor microenvironment", BIOL-40200, University of California, San Diego Extension, La Jolla, CA
February 2004	"Integrin regulation of angiogenesis" Children's Hospital, University of Southern California, Los Angeles, CA
February 2004	"Integrin $\alpha 4\beta 1$ regulation of stem cell trafficking" Biogen-Idec, Del Mar, CA
January 2004	Integrin $\alpha 4\beta 1$ regulation of stem cell trafficking" Keystone Symposium on Angiogenesis, Santa Fe, NM
November 2003	"Integrin $\alpha 4\beta 1$ regulation of stem cell trafficking" UCLA Vascular Biology Seminar, Los Angeles, CA

October 2003	"Integrin $\alpha 4\beta 1$ regulation of stem cell trafficking" AACR New Directions in Angiogenesis Research, Chicago, IL
October 2003	"Del-1: an angiogenic protein" Valentis, Inc. Burlingame CA
September 2003	"Cell adhesion and the regulation of neovascularization" Rheumatology Grand Rounds, UCSD, La Jolla, CA
August 2003	"Integrin $\alpha 4\beta 1$ regulation of stem cell trafficking" Gordon Conference on Angiogenesis and Microcirculation, Newport, Rhode Island (nominated for chair)
June 2003	"Mechanisms regulating angiogenesis" Sidney Kimmel Cancer Center, San Diego, CA
May 2003	"Mechanisms regulating angiogenesis", UCSD Department of Medicine PRISM lecture series
Dec 2002	Session co-chair, Angiogenesis mini-session, ASCB annual conference, San Francisco, CA
July 2002	"Angiogenesis Research at the UCSD Cancer Center", UCSD Cancer Center Board of Directors, La Jolla, CA
June 2002	"Regulation of Angiogenesis by Integrin-Mediated Signal Transduction", The Second International Conference on Tumor Microenvironment: Progression, Therapy and Prevention, Baden, Austria
May 2002	"Integrin $\alpha 5\beta 1$ in the Regulation of Angiogenesis" EOS Biotechnology, San Francisco, CA
February 2002	(Session Chair) "Fibronectin binding integrin in Angiogenesis" Keystone Symposium: Biological Response to the Extracellular Matrix, Banff, Canada
January 2002	"Del-1: an Angiogenic Protein," University of California, San Francisco, San Francisco, CA
October 2001	"Techniques in Angiogenesis Research", Modern Techniques of Biomedical Research (MED 260) UCSD, La Jolla, CA
August 2001	"Del1: an Angiogenic Protein" Valentis Inc., Burlingame, CA
August 2001	"Role of integrin $\alpha 5\beta 1$ in angiogenesis", EOS Biotechnology. San Francisco, CA

August 2001	"Integrin $\alpha 4\beta 1$ in angiogenesis", Biogen, Inc. Cambridge, MA
June 2001	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ and protein kinase A", BIO2001 San Diego, CA
February 2001	"Mechanisms Regulating Angiogenesis" Howard Hughes Undergraduate Program, UCSD, La Jolla, CA
January 2001	"Regulation of angiogenesis by the extracellular matrix" Scripps Research Institute, La Jolla, CA
October 2000	"Regulation of angiogenesis by the extracellular matrix" University of California, San Diego Hematology/Oncology Seminar Series, La Jolla, CA
July 2000	"Angiogenesis and the Extracellular Matrix," Vascular Biology Gordon Conference, Plymouth, NH
May 2000	"Novel Anti-angiogenic Targets in Cancer Therapy" University of California, San Diego Cancer Pharmacology Seminar Series, La Jolla, CA
February 2000	"Regulation of angiogenesis by the extracellular matrix" University of California, San Diego University of California, San Diego Clinical Immunology and Arthritis Seminar Series, La Jolla, CA
November 1999	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", EOS Biotechnology, San Francisco, CA
October 1999	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", Cambridge Healthtech Institute Conference on Angiogenesis Inhibitors, San Diego, CA
September 1999	"Regulation of angiogenesis by integrins", University of California, San Diego Biomedical Sciences Graduate Program, San Diego, CA
March 1999	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", Metabasis Therapeutics, La Jolla, CA
April 1999	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", Axys Pharmaceuticals, Inc., La Jolla, CA

October 1998	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", Boehringer Ingelheim, Vienna, Austria
October 1998	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", Progenitor, Inc., Menlo Park, CA
September 1998	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", University of California, San Diego Biomedical Sciences Graduate Program, La Jolla, CA
August 1998	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", Boehringer Ingelheim, Ridgefield, Connecticut
June 1998	"Regulation of angiogenesis by integrin $\alpha 5\beta 1$ ", McGill University, Montreal, Canada
June 1998	"Angiogenesis and Breast Cancer", University of California, San Diego Breast Cancer Research Focus Group, University of California, La Jolla, CA
May 1998	"Regulation of angiogenesis by integrins $\alpha v\beta 3$ and $\alpha 5\beta 1$ ", University of California, San Diego BMS 224, La Jolla, CA
April 1998	"Integrins and angiogenesis", New York Academy of Science, New York, NY
March 1998	"Angiogenesis and integrins", Inflammation Research Association, Chicago, IL
November 1997	"Integrins and cancer," University of California, San Diego Clinical Immunology and Arthritis Seminar, La Jolla, CA
June 1997	"Anti-angiogenic properties of 7E3, an integrin $\beta 3$ subunit antagonist in the SCID mouse/human skin model of angiogenesis," XVIth Congress of the International Society on Thrombosis and Haemostasis, Florence, Italy
October 1996	"Role of integrin $\alpha 5\beta 1$ in tumor cell growth" Australian Vascular Biology Society, Marysville, Australia
October 1996	"Role of integrin $\alpha 5\beta 1$ in tumor cell growth" University of Adelaide, Adelaide, Australia
October 1996	Integrins $\alpha v\beta 3$ and $\alpha 5\beta 1$ in cancer" Sidney Kimmel Cancer Center, La Jolla, CA

Sept. 1996	Integrins $\alpha v\beta 3$ and $\alpha 5\beta 1$ in cancer" Allergan, Irvine CA
August 1995	"Role of αv integrins in angiogenesis", Berlex Biosciences, Richmond, CA
July 1995	"The role of $\alpha v\beta 3$ in angiogenesis", Schering Plough Research Institute, Kenilworth, NJ
June 1995	"The role of $\alpha v\beta 3$ in angiogenesis", Merck and Co., West Point, PA
June 1995	"The role of integrins in cancer," Department of Medicine, University of California, San Diego, La Jolla, CA
May 1995	"Use of antagonists of integrin $\alpha v\beta 3$ for the therapy of cancer" American Society of Clinical Oncology, Los Angeles, CA
April, 1995	"Role of αv integrins in angiogenesis," Allergan, Irvine, CA
April 1995	"Antagonists of integrin $\alpha v\beta 3$ for the treatment of cancer" in Angiogenesis Inhibitors, sponsored by Cambridge Healthtech Institute, Washington, DC
March 1995	"Antagonists of integrin $\alpha v\beta 3$ for the treatment of angiogenic disease, Gordon Conference, Oxnard, CA
September 1994	"Commercialization of antagonists of integrin $\alpha v\beta 3$ for the treatment of cancer", in Commercial Applications of Apoptosis, San Diego CA
August 1994	"Antagonists of integrin $\alpha v\beta 3$ for restenosis," National Institute of Aging, NIH, Baltimore, MD
March 1994	"Role of integrin $\alpha 5\beta 1$ in tumor cell proliferation" La Jolla Cancer Research Foundation, San Diego, CA
Dec. 1993	"Extracellular matrix and cell signaling" American Society for Cell Biology Annual Meeting , New Orleans, LA
July 1993	"Regulation of cellular proliferation by integrin $\alpha 5\beta 1$," Imperial Cancer Research Foundation, London, England

June 1993	"Regulation of cellular proliferation by integrin $\alpha 5 \beta 1$ " North Carolina Biotechnology Center, Research Triangle Park, NC.
April 1990	"Isolation of immunoglobulin from the Pacific hagfish," Tampa Bay Research Institute, St. Petersburg FL.
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